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Sleep Disorders

An Overview

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Summary This chapter introduces the reader to the different classifications of sleep disorders. This chapter comprises nine general sections of main sleep disorders encountered in the general population: insomnia, sleep apnea, narcolepsy, hypersomnias, periodic limb movement disorder, restless leg syndrome, REM-related parasomnias, non-REM-related parasomnias, and circadian rhythm disorders. Each section provides a general definition/description of the disorder, diagnosis pointers, main consequences associated with the disorder as well as some treatment options. When available, prevalence and incidence data are provided. Two short clinical vignettes illustrate main complaints of insomnia and apnea. These vignettes also report some daily consequences of the unrefreshing and disturbed sleep experienced by the sleepers. Although most sleep disorders are diagnosed and treated, the present chapter also highlights that some of them nonetheless may go unnoticed to the suffering individuals but not to his/her bed partner/significant other. Furthermore, daily consequences associated with sleep disorders are various, and a thorough examination of all side effects shall be taken into consideration during evaluation and when treatment is initiated. Sleep medicine is a growing field and the common goal of all clinicians and researchers is by far to alleviate sleep disorders' sometimes disastrous consequences and increase the quality of life of suffering individuals.

Keywords Sleep disorders · vignettes · diagnosis · consequences · treatment · quality of life

Learning objectives:

- General definition of major sleep disorders.
- An overview of consequences associated with sleep disorders.
- One or two treatment options for each defined disorder.

Introduction

It is today widely recognized that at least 15% of the general population suffer from a sleep disorder. All age groups, from early years through middle and late years of life, can be afflicted. Furthermore, this percentage can be tripled in psychiatric settings. Primary or secondary to either a psychopathology, medical illness, medication intake, or another sleep disorder, when one does not sleep or perceives not to sleep adequately; his/her quality of life is undeniably affected. This chapter is devoted to a general overview of the different sleep disorders either reported by an individual or, as

also encountered in general practice, reported by a significant other.

Classification and Diagnosis

We have created a new clinical specialty, sleep disorders medicine, whose task is to watch over all of us while we are asleep. —William Dement (1985)

In recent years, the American Sleep Disorders Association and the different task forces devoted to the study and diagnosis of sleep disorders (such as NIMH and associated professional associations) have made genuine progresses in the recognizance of sleep disorders in the general population as well as in clinical settings. In sleep disorders medicine practice, the *International Classification of Sleep Disorders* (ICSD; 1) now proposes four general sections of sleep disorders: dysomnias, parasomnias, sleep disorders associated with medical/psychiatric disorders, and other proposed sleep disorders. In addition, the diagnostic classification of sleep and arousal disorders are grouped under four different

coding: DIMS (disorders of initiating and maintaining sleep—insomnias); DOES (disorders of excessive somnolence); disorders of the sleep wake schedule, and dysfunctions associated with sleep, sleep stages or partial arousals (parasomnias). On the other hand, 18 different disorders associated with insomnia or hypersomnia can be found in *The Diagnostic and Statistical Manual of Mental Disorders* (4th ed., 2).

Examples of Sleep Disorders

The venue of sophisticated technologies, such as polysomnography, has enhanced our understanding of sleep disorders. In addition, the development and validation of questionnaires now provide good insights and pointers of the impact of sleep disorders on one's well-being and daily functioning. Although we have learned through sleep deprivation studies that sleep loss diminishes daytime performance, increases sleepiness, and affects mood, these same observations are also the result of various sleep disorders. If you are not convinced, consider the following two case illustrations:

1. After tossing around for what seemed an eternity, Geraldine turns to the bedside. Three a.m. says the red light on the alarm clock. "Oh no, not tonight again... I can't sleep..." Geraldine thinks: "I have that big meeting tomorrow... How am I going to be able to deliver that talk effectively if I don't have a good night's sleep...?"
2. "Leon, we have to do something about this gasping and snoring at night. Don't you hear yourself? I can't take this anymore! I will make an appointment with Doctor Zacks right this morning. There must be something we can do about this. At the same time, maybe you can discuss with him the fact that you are falling asleep everywhere, even behind the wheel?"

There is no doubt that the most prevalent sleep disorder is insomnia as depicted in case 1. Although not always confirmed by objective measures, it remains nonetheless a puzzling disorder that heavily burdens the suffering individual as well as society, as billions of dollars derive from its consequences everyday, albeit be in work absenteeism, loss of performance, or health care systems use. On the other hand, and not less psychologically/cognitively costly for the individual, sleep apnea, as depicted in case 2, if left undiagnosed, can lead to serious consequences such as cardiovascular diseases and even death.

Major Sleep Disorders

Insomnia

As approximately 30% of the general population experience insomnia symptoms, 10% suffer from insomnia syndrome (3,4). Insomnia, as a symptom, is a diagnosis criterion of other mental disorders (e.g., depression) and as a syndrome, may be secondary or comorbid to another disease. DSM-IV (2)

qualifies *chronic primary insomnia* as a complaint of difficulty initiating or maintaining sleep or of a sleep of poor quality for a period of at least a month. In addition, daytime functioning must be impaired or distress must be presented. Moreover, sleep difficulties should not be due to another health or mental disorder or to substance consumption. According to the International Classification of Diseases (ICD-10, 5) and the ICSD, insomnia should last at least 6 months to be qualified as chronic. Female gender, as well as increasing in age are a risk factor associated with the disorder (3,4).

ICSD adds sub-classifications to the diagnosis of insomnia. In some cases, complaints of sleep difficulties are objectively observable, in other cases, they are not. In other words, a patient may complain of sleep difficulties while objective polysomnographic recordings are normal, or there may be constant and important gap between objective and subjective measures of sleep (6). In fact, depending on the diagnosis criteria used, as much as 50% of individuals suffering from primary insomnia could be poor estimators of their sleep length and, consequently, classified as suffering from *paradoxical insomnia*, sleep state misperception or subjective insomnia (7). All three terms are found in the scientific literature to qualify this condition. While paradoxical insomnia sufferers and good sleepers seem to be equivalent on measures of sleep macroarchitecture, there may be subtle and finer differences in the microarchitecture characterizing both groups (8).

Among insomnia sufferers estimating their sleep accurately, and therefore presenting real deficits in the initiation or continuity of sleep, are found patients suffering from *psychophysiological insomnia*. The patients are assumed to be conditioned by sleep-related stimuli of the environment (e.g., bedroom) or bedtime routine, which are then associated in the patient's mind with the anxiety, fear, or frustration of having trouble to sleep (9–11). Consequently, their level of arousal is increased, preventing them from a good night sleep. Moreover, when awake in bed, they report rumination, excessive worrying, and catastrophic thinking on consequences of sleep loss.

A third form of primary insomnia, less common but still acknowledged, is *idiopathic* or *childhood-onset insomnia*. In this case, insomnia is reported since early childhood, typically before the age of 10 if not since birth and has always been relentless. A genetic disposition may explain a proportion of the idiopathic insomnia cases but not all. Also, a higher rate of difficult and premature deliveries is found in the idiopathic insomnia population compared to the general population (12,13).

Consequences related to insomnia are multiple: fatigue, sleepiness, mood disruption (14), and reported impaired attention and memorization are frequent complaints (15). In addition, falling asleep in inappropriate places (i.e., at work, theater, reading, or driving an automobile) is problematic. Moreover, irritability and avoidance of certain activities may be isolating. Sleep aids, increased medical visits, and

absenteeism from work imply important costs for the patient as well as society (16, 17). There are evidence of the efficacy of several psychological treatments for insomnia such as stimulus control therapy, relaxation, paradoxical intention, sleep restriction, and cognitive behavior therapy (18). In addition, effective pharmacologic therapies, including benzodiazepine and newer non-benzodiazepine hypnotics, improve sleep maintenance although side effects are possible (19).

Sleep Apnea

Obstructive, central, and mixed sleep apneas are conditions where the breathing is repeatedly disrupted during sleep. Obstructive apnea, which affects 4% of men and 2% of women in the middle age (20), causes the soft tissues of the rear of the throat to collapse, consequently blocking the airway. This disorder may be the result of an airway malformation, such as maxillomandibular malformation or adenotonsillar enlargement, an excess of fatty tissues in the airway, or the relaxation and collapsing of the muscles during sleep; therefore, it is most common in middle-aged and overweight men. Typically, obstructive apnea creates loud snoring followed by 20–30 s of silence. Central apnea appears in cases of neuromuscular pathologies or brain stem lesions where the brain fails to signal the breathing. Accordingly, breathing efforts as well as airflow are interrupted. Mixed sleep apnea refers to both obstructive and central problems.

Consequences of sleep apnea are found during sleep and daytime as well (20). As the patient inhales after a breathing failure, microarousals and body movements occur and affect sleep quality which causes daytime sleepiness. Sometimes, arousals following obstructive events are associated with chest discomfort, suffocation, choking, or intense anxiety. Cardiac arrhythmias associated with apnea events are at the origin of the increase risk of sudden death during sleep. Typically, patients report severe dryness of the mouth along with the feeling of being unrefreshed in the morning. Concentration and memory problems generally result from oxygen desaturation as well as from sleepiness associated with the disturbed sleep. About 20% of patients complain of morning headache although it is not specific to sleep apnea. A decrease of testosterone attributable to the reduced oxygen saturation may also decrease libido. Complaints of excessive sleepiness are usual but can vary amongst sleep apnea sufferers. Sleepiness is most evident in relaxing situations although in active ones, sleepiness can result in accidents, job loss, or family problems. Secondary depression, anxiety, irritability, and despair are common. Therefore, the treatment of sleep apnea should address daytime sleepiness, the suppression of apneas, and the restoration of normal oxygenation during sleep (21). Weight loss may be indicated in some cases. Nasal continuous positive air pressure (N-CPAP) is actually the most prescribed treatment for obstructive sleep apnea (22).

Narcolepsy

The diagnosis of narcolepsy affects 20–60 persons per 100,000 and has a peak incidence between the ages of 15 and 35 years (23). The excessive sleepiness that characterizes narcolepsy is usually illustrated by multiple refreshing naps during the day, of about 10–20 min, after what sleepiness increases again until another nap is needed 2–3 h later. Sleep may occur during calm activities such as traveling, listening to music, watching television, and reading, but it can also happen in sleep-incompatible situations: eating, talking, or even driving. Sleepiness can be tolerated with much effort, but eventually, sleep attacks are inevitable. In fact, signs of drowsiness are found on electroencephalographic daytime recordings. Multiple sleep latency test (MSLT) sleep onset measures are often below 5 min and contain two or more REM periods (24). Night PSG reveals an increased number of awakenings as well as an increased amount of stage 1 (25). Sometimes, hypnagogic hallucinations or sleep paralysis are reported. Over the years, sleepiness can improve due to coping strategies of the patient or worsen and be associated with the development of periodic limb movement or sleep apnea. Naps or amphetamine-like drugs may help to reduce daytime sleepiness (26).

Cataplexy is the second characteristic symptom of narcolepsy for which onset occurs either simultaneously or after the onset of sleepiness symptoms. It is defined by a sudden loss of muscular tone for a few seconds or minutes caused by a strong, pleasant, or exciting emotion. While consciousness, memory, and respiration remain intact, selected bilateral muscles or all skeletal-muscle groups are affected by the loss of tone. The intensity of cataplectic episodes may vary, for example, when the intensity is mild, the weakness may not be discernible to others. The frequency of cataplectic events varies from one individual to another: one may suffer from several episodes during a day as another may only have a few per year. In patients with severe and frequent cataplectic episodes, tricyclic antidepressant medications are indicated to reduce the symptoms (27) and patients may learn how to avoid attacks in the long run. However, the frequency of events generally decreases over time.

Because of sleepiness and cataplexy, individuals suffering from narcolepsy are at higher risk of having accidents in home and work environments as well as on the road. In addition, education, occupation, and social relations may be affected by the disorder and therefore affect the patient's quality of life.

Hypersomnia

ICSD distinguishes recurrent hypersomnia, idiopathic hypersomnia, and post-traumatic hypersomnia. All forms are characterized by a complaint of excessive daytime sleepiness and/or a prolonged nocturnal sleep period and daily sleep periods.

Recurrent Hypersomnia

Prevalence data for recurrent hypersomnia are still unknown. The onset is most frequent in adolescence although it also occurs through adulthood. It is believed to affect more men than women although the true sex ratio has not yet been identified. Recurrent hypersomnia consists of episodes of severe sleepiness often precipitated by acute febrile episodes and severe somatic stress. Somnolence must last at least 18 h a day during a period of 3 days to 3 weeks. These periods must also occur at least one to two times a year. In Klein-Levin syndrome (28), the best known form of recurrent hypersomnia, patients may sleep for up to 18–20 h a day, waking only to rapidly consume large amount of food and void. A monosymptomatic type of the disorder is also described without the binge eating but includes possible disorientation, forgetfulness, depression, depersonalization, and occasional hallucinations as well as behavior changes (irritability, aggression, and impulsive behaviors). Following somnolence episodes, transient dysphoria, insomnia, elation, restlessness, or sexual hyperactivity may be observed. All presented symptoms severely affect the patient's social and occupational life; yet, in between episodes of hypersomnia, sleep returns to normal and patients seem medically and mentally healthy. Lithium is a good prophylactic choice when the frequency of hypersomnia episodes is high (29).

Idiopathic Hypersomnia

The complaint of a constant or recurrent sleepiness during the day, daytime sleep episodes, or prolonged night sleep occurring before the age of 25 refers to idiopathic hypersomnia. Complaints of difficulty waking up, disorientation after awakening, sleep attacks preceded by drowsiness, and unrefreshing short naps may also be present. The prevalence of this rare disorder is still unknown. The course of the disorder is progressive but stabilizes and lasts lifelong. Stimulant drugs are the most prescribed treatment although morning sleep drunkenness is difficult to treat (30).

Post-Traumatic Hypersomnia

Post-traumatic hypersomnia implies the complaint of excessive sleepiness and the occurrence of frequent daily sleep episodes for which the onset is associated with a head trauma. Therefore, the patient's sleep pattern differs from pre-trauma to post-trauma. Headache, fatigue, difficulty to concentrate, and impaired memory can be associated with the disorder. Typically, the sleepiness resolves itself over weeks or months.

Periodic Limb Movement Disorder

Periodic limb movement disorder (PLMD) affects 4–11% of the general population (31). Up to 17% of patients with insomnia may be affected with PLMD (32), and it is most common in patients with narcolepsy (33) and obstructive sleep apnea (34) than in the general population. It can be induced

or aggravated by the use of monoamine oxydase inhibitors and tricyclic antidepressants or the withdrawal of anticonvulsants, benzodiazepines, barbiturates, and others. PLMD consists of periodic episodes of limb movements which can appear from the onset of stage 1 sleep. Movements are frequent in stage 2 sleep, decrease in stages 3 and 4, and are usually absent during REM sleep. The movement is characterized by an extension of the big toe with partial flexion of the ankle, knee, and sometimes hip, followed by a period where the legs are still. Upper limb movements are also probable. Movements can be observed on one or both legs but not necessarily simultaneously or symmetrically. PSG recordings showing a minimum of four repetitive contractions of 0.5–5 s at the anterior tibialis electromyogram (EMG) separated by a 20- to 40-s interval constitute an episode for the calculation of the periodic limb movement index (PLM index) which represents the number of episodes per hour of total sleep time. Movements can be present for few minutes, few hours, or can occur throughout the entire night. In severe cases, movements during wake can also occur. A K-complex, arousal, or awakening is generally associated with the movement. While a PLM index of at least five occurrences associated with an EEG arousal or awakening is considered as mild, a severe diagnosis would exceed an index of 20. Thus, PLMD is associated with fragmented sleep, restless sleep, complaints of insomnia, and/or excessive daytime sleepiness. Anxiety and depression may be correlated to the chronicity of the disorder. In some cases, the bed partners' sleep may also be disrupted by the PLM of the patient, without the patient being aware himself/herself of the limb movements. L-dopa and dopamine agonists are actual pharmacologic treatments used for PLMD although there is still a need for controlled randomized studies assessing both PLMD and subjective sleep parameter (31).

Restless Legs Syndrome

Restless legs syndrome (RLS) is most common amongst women (35). About 11% of the general population suffer from RLS (35) and it has been identified in 26% of pregnant women (36) and 18% of uremic patients (37). Symptoms consist of unpleasant sensations, ache and discomfort, pulling, or itching in the legs at night that cause an urge to move the legs. RLS is also characterized by the partial or complete relief when legs are moving and the recurrence of the sensations as movements stop. The symptoms are usually felt between the ankle and the knee but may also include the thighs, feet, and, more rarely, arms. Rest or long seated periods may cause symptoms lasting from a few minutes to several hours. Most RLS patients also show PLMD during sleep, and when both syndromes are diagnosed, involuntary limb movements during wake may occur. The disorder may last several years with periods of increasing and declining symptoms. RLS typically interferes with sleep onset. Severe insomnia may be a consequence to RLS. Moreover, patients may present symptoms of anxiety or depression as well as psychosocial dysfunction. Various treatments are now offered for RLS (38). Behavioral and counter

stimuli interventions—such as mental and physical activities, massages, or hot bath—and the avoidance of RLS possible exacerbators (caffeine, alcohol, nicotine, and some medications) can ameliorate symptoms. As iron deficiency is thought to play a role in RLS, iron replacement is a potential cure. Pharmacotherapies for RLS include dopaminergic agents, opiates, benzodiazepine receptor agonists, and antiepileptics.

REM-Related Parasomnias

Sleep disorders occurring specifically in REM sleep include a total of six different pathologies. As the objective of this section is to briefly present REM-sleep parasomnias, only nightmares, sleep paralysis, and REM-sleep behavior disorder will be discussed. Note that REM-related parasomnias also include other disorders: impaired sleep-related penile erections, which is defined by a weakened penile tumescence during sleep that would not be sufficient to engage in sexual intercourse, sleep-related painful erections, a condition where penile erections are painful only during sleep and may cause awakenings from REM sleep, and REM-sleep-related sinus arrest, a cardiac rhythm disorder in otherwise healthy persons.

Nightmares

The nightmare is defined by a long and complicated dream with structured sequences of images and a content that becomes increasingly threatening to the dreamer. It occurs during REM sleep on the second half of the night and is followed by an awakening that can be delayed, but even so, there is a recall of a frightening dream. Upon awakening, full alertness occurs immediately with a little confusion or disorientation and the return to sleep is delayed. Nightmares affect 10–50% of children between the age of 3 and 6. Less common in adults, 50% of the population report having occasional nightmares and approximately 1% have at least one per week (39). In various personality disorders, namely schizotypal personality, borderline personality and schizoid personality, and in schizophrenia, the presence of frequent nightmares is increased as it is the case for individuals presenting some features of these disorders. Stressful life periods or traumatic events tend to increase the frequency and severity of nightmares. Desensitization techniques might be helpful in adults to overcome nightmares (40).

Sleep Paralysis

Patients who experience or suffer from sleep paralysis report an inability to execute voluntary movements, usually for periods of time lasting from 1–7 min, at sleep onset or upon awakening. While ocular and respiratory movements are possible, limb, trunk, and head are typically immobile. A sensation of difficulty breathing may be present and contribute to the frightening character of the situation. Threatening hypnagogic imagery or dreamlike mentation may also be present. Sleep paralysis ceases spontaneously by mean of touch and

movement induced by another person, by repeated efforts to move, or by vigorous eye movements. Appearing in an isolated or a familial form, sleep paralysis may also be a symptom of narcolepsy. The latter two forms tend to be more chronic while the former is associated with predisposing factors. Such factors often include irregular sleep habits, sleep deprivation, shift work, or jet lag. Other factors that might also induce sleep paralysis are mental stress, overtiredness, and sleeping in the supine position. The cause of sleep paralysis is thought to be a microstructural change, a neurochemical or neuroimmunologic dysfunction in the mechanism controlling the normal motor paralysis of the REM sleep stage. Six percent of the general population report a chronic complaint of sleep paralysis while another 6% experience at least one episode in their lifetime (41). In some cases, episodes may cause chronic anxiety or depression, but the disorder is usually without complications.

REM Sleep Behavior Disorder

REM sleep behavior disorder (RBD) is characterized by elaborate movements correlated with dream mentation during REM sleep. This condition contrasts with the electromyographic atonia normally found in this sleep stage. Punching, kicking, leaping, and diving out of bed occurring without an awakening are examples of reported movements associated with the content of dreams (42). RBD usually appears after a minimum of 90 min of sleep, and the frequency of episodes is variable, for instance, violent ones may occur from once a week to several times a night. PSG confirms a persistent muscle tone in REM sleep, excessive limb or body jerking and complex, vigorous or violent behaviors. Strong movements may harm the patient or the bed partner and cause significant social consequences. RBD is rare and affects more men than women. It usually begins progressively after the age of 50 but may start at any time (43, 44). At the onset of the disorder, dreams may become more vivid, unpleasant, violent, or active. Clonazepam reduces the number and intensity of behaviors during REM sleep (45).

Non-REM-Related Parasomnias: Arousal Disorders, Sleep–Wake Transition Disorders, and Other Parasomnias

Non-REM-related parasomnias comprise a variety of sleep disorders which, by nature, are undesirable physical phenomena associated with sleep. Some of them usually affect children, such as sleep enuresis, infant sleep apnea, congenital central hypoventilation syndrome, sudden infant death syndrome, and benign neonatal sleep myoclonus. Other non-REM sleep parasomnias are relatively rare like sleep-related abnormal swallowing, nocturnal paroxysmal dystonia, and sudden unexplained nocturnal death syndrome. As sleep bruxism (8.1), primary snoring, confusional arousals, sleepwalking, and sleep terrors are widespread, explicit definitions are given below.

Sleep Bruxism

Teeth-grinding or teeth-clenching occurring in sleep characterizes sleep bruxism. Such sleep disorder may be very unpleasant due to loud sound created by teeth-grinding and teeth-clenching as well as to jaw muscle discomfort it produces. It may also cause abnormal teeth wear or periodontal tissue damage (46), atypical facial pain, or headache. PSG recordings demonstrate that events of bruxism can be coupled with short arousals and are most frequent in stage 2 sleep; nonetheless, they can take place in all sleep stages (47). Predisposing factors of bruxism are minor dental, mandibular or maxillary pathologies, anxiety, cerebral palsy, and mental retardation in children. Lifetime prevalence of teeth-grinding is as high as 85–90% in the general population. However, it is severe enough to represent a clinical condition in only 15–22% of them (47). Generally, beginning between 10 and 20 years of age, the course of sleep bruxism may vary according to perceived stress or otherwise may be chronic. Possible treatments include occlusal adjustment and splints, psychotherapy, medications, physical therapy, muscle relaxants (such as diazepam), and suggestive hypnotherapy (47,48).

Primary Snoring

Most prevalent in the middle age and overweight men, primary snoring lasting half of the night affects 22% of individuals (mostly men) between 40 and 65 years old (49). It is diagnosed by an observer noticing a loud sound produced by the vibration of pharyngeal tissues during inspiration or expiration, without evidence of apnea, hypoventilation, complaint of insomnia, or excessive daytime sleepiness. Typically, the snoring is continuous and occurs while the sleeper is in a supine position. The patient is not always aware of the snoring but may experience dry mouth which might force him to wake up to drink water. The use of central nervous system depressants, nasal congestion or obstruction, and obesity are main factors predisposing to primary snoring. Furthermore, primary snoring predisposes to obstructive sleep apnea. Hypertension, ischemic heart disease, and cerebrovascular disease are possible medical complications of snoring.

Confusional Arousals

Before the age of 5 years, almost every child will have experienced confusional arousals. This condition affecting only 4% of adults (50) is described as a state of confusion during and following an awakening generally from deep sleep, in the first third of the night. More precisely, the patient experiences disorientation in time and in space, inappropriate behavior and slow speech, mentation, and response to questions during several minutes to several hours. Predisposing factors are young age, recovery from sleep deprivation, circadian rhythm sleep disorders, the use of central nervous system depressants, hypersomnia, sleep apnea syndrome, sleep terrors,

sleepwalking, and sometimes excessive exercises. Episodes of confusional arousals can be induced by forced awakenings. There are risks of personal injuries, and patients may become aggressive if they are restrained as they awake.

Sleepwalking

Sleepwalking is diagnosed by ambulation occurring in sleep, difficult arousal of the patient, and amnesia of the episode. PSG recordings indicate that it occurs in sleep stages 3 or 4 and mostly at the end of the first or second episode of slow wave sleep. Sleepwalking episodes can occur several times a week or only in presence of precipitating factors such as obstructive sleep apnea or other sleep disorders disrupting slow wave sleep, as well as internal or external stimuli. Most prevalent between 4 and 8 years of age, it generally disappears in adolescence and is rare in adults (50). In folk wisdom, sleepwalking has often been associated with inappropriate and dangerous behaviors. In fact, physical injuries, falls, and attempts to escape are possible risks associated with the disorder. Violent behaviors are more common in males experiencing stressors and abusing of caffeinated beverages and drugs (51). In children particularly, this condition can result in embarrassment or social isolation associated with the avoidance of sleeping elsewhere. Providing a safe sleep environment, closing doors and windows is appropriate for children. In severe adult cases of sleepwalking, benzodiazepines may be indicated (52).

Sleep Terrors

Sleep terrors are another disorder inducing awakening from slow wave sleep. Complaining of a sudden episode of intense terror during sleep, usually in the first third of the night, patients also experience partial or total amnesia of the event. During an episode of sleep terror, an autonomic discharge occurs including, for example, tachycardia, tachypnea, blushing of the skin, and diaphoresis. If patients awake before the end of the autonomic discharge, they may be conscious of this activation and report vague, brief and vivid dream images, or hallucinations. Sometimes, they may also try to escape from bed, fight, cry, or scream. It may be precipitated by fever, sleep deprivation, or the use of central nervous system depressant medications. Affecting 3% of children (53) and 4–5% of adults (54), sleep terrors are most often observed in children between 4 and 12 years of age and usually resolves itself during adolescence. In adults, psychopathologies may be associated with the disorder. However, such association should not be supposed in the case where children suffer from sleep terrors nor do children have a higher incidence of psychopathology than the general population. Sleep terrors may have negative consequences such as potential harm of patient or others and social embarrassment in relation to the disorder.

Circadian Rhythm Disorders

Circadian rhythm disorders refer to a desynchronization of the sleep during the 24-h day due to a problem of eliciting sleep when needed, desired, or expected. Other sleep disorders such as insomnia or narcolepsy may affect sleep timing, but in those cases, the primary diagnosis would be retained. A circadian rhythm disorder diagnosis should be made only when sleep timing is the primary cause of the sleep problem and when it does not encounter societal norms in that matter. Environmental factors dependent of the individual may induce some circadian rhythm disorders. For instance, in time zone change syndrome, the rapid travel across time zones causes difficulties of initiation and maintenance of sleep at the new time zone hour, excessive sleepiness during daytime, diminished subjective alertness and performance, and somatic symptoms. In shift work sleep disorder, transient symptoms of insomnia and sleepiness appear as the worker changes his work schedule including in it his habitual sleep period. Other circadian sleep disorders may have a more intrinsic or extrinsic nature, as the ones described below.

Irregular Sleep–Wake Pattern

Often presented as a complaint of difficulties initiating or maintaining sleep, irregular sleep–wake pattern is defined by at least three fragmented sleep periods during the 24-h day. Although the sum of the sleep periods corresponds to the norms according to the age of the patient, no sleep period is of normal length and sleep patterns are unpredictable as reported in the sleep logs (55). This condition is most common in patients with severe congenital or developmental brain dysfunction, in the elderly suffering from degenerative brain dysfunction, but may also occur in otherwise healthy patients. Other predisposing factors are a lack of regular daily routine, frequent naps, spending excessive time in bed, or bed rest for medical reasons and chronic depression. This rare condition predisposes patients to drug dependency, subjective cognitive impairment, and sleepiness. Daytime functioning and consolidation of sleep cycles can be improved by increasing exposure to bright light and structured social and physical activities (55).

Delayed Sleep-Phase Syndrome

Presented as a complaint of an inability to fall asleep and wake at the desired times, or of excessive sleepiness, delayed sleep-phase syndrome (DSPS) corresponds to a phase delay of the major sleep episode compared with the desired time for sleep (56). In patients with DSPS, as well as in normal individuals, night-shift work, late-night studying, or mental illness may induce a transient phase delay. However, patients with DSPS are thought to have weaknesses in the ability to synchronize their circadian systems with environmental time cues and therefore postpone their sleep phase (57). When there are no obligations to follow a normal schedule, patients

have a sleep period of normal quality and duration, awake spontaneously, and keep a regular 24-h pattern of delayed sleep. The prevalence in the general population is unknown but could affect 5–10% of patients complaining of insomnia in sleep clinics (58). The onset of DSPS usually happens in adolescence (59); nevertheless, it can occur in children but is rare in adults over the age of 30. Complications such as absenteeism, chronic tardiness, or judgments by others (of laziness, for example) may occur at school, work, or in social activities. Chronotherapy, consisting in a supplementary sleep onset delay of 3 h a day until the desired time for sleep is reached, may help if the patient keeps a stable routine afterward. Phototherapy advances sleep time by the exposition in the morning to a 2500 lux light (60). Melatonin and vitamin B12 have also suggested interesting results in the treatment of DSPS (61, 62).

Advance Sleep-Phase Syndrome

Contrary to DSPS, advance sleep-phase syndrome is described by an advance of the sleep episode in comparison to the desired clock time. Complaints of terminal insomnia and inability to stay awake in the evening while having a sufficient amount of sleep may be reported. Sleep onset occurs typically between 6 p.m. and 8 p.m.; consequently, the last awakening happens between 1 a.m. and 3 a.m. An explanation of the disorder mentions a possible oversensitive phase advance capability or an altered ability of phase delay in the patient (55). This rare condition is theoretically most associated with elderly than other age groups. Negative consequences of advance sleep-phase disorder may be evening somnolence or sleep onset occurrence while attending social activities or driving. Chronic sleep deprivation and daytime sleepiness may also occur if obligations in the evening repeatedly postpone the sleep onset period. Preferred treatment options for advance sleep-phase syndrome are chronotherapy, timed bright light exposure in the evening, and hypnotics to maintain sleep until morning (55).

Non-24-h Sleep–Wake Syndrome

In individuals suffering from non-24-h sleep–wake syndrome, the sleep–wake rhythm has a 1- to 2-h delay in sleep onset and awakening each day despite the environmental and social cues. As a result, sleep onset and offset are progressively delayed, until at some point, the delay reaches 24 h and the sleep schedule returns to normal. Therefore, at times patients are “in phase” with the conventional social hours for sleep period, feeling alert and not complaining of sleeping difficulties. At other times, when there is a phase delay, patients complain of difficulties to fall asleep and to stay awake in the daytime. Consequently, scheduling activities or work becomes difficult and psychosocial functioning may be impaired. This rare disorder seems to be most prevalent in blind individuals (63). It is also seen, although less frequently,

in patients suffering from severe schizoid or avoidant personality disorder. Sometimes, behavioral intervention consisting of a strict sleep–wake schedule including strong social time cues may work. Hypnotic drugs do not seem to help but melatonin and vitamin B12 have shown some interesting effects in the treatment of the non-24-h sleep–wake syndrome (61,64).

Conclusion

Sleep disorders are very prevalent in the general population. Although their presence may sometimes remain unnoticed for a fair period of time (e.g., apnea or PLMD), the repercussions on daily functioning are often noticeable, for the individual and his/her family and colleagues. Quality of life is so diminished and impaired in some sufferers that it translates in loss of work and even, at worst, family disintegration (e.g., divorce). The risk factors and the extent of side effects of sleep disorders are still understudied, and the routine use of questionnaires offering a closer look at the individual's global functioning are more than needed. Fortunately, research in sleep medicine is very active, and everyday, new and better treatments are developed and applied to relieve sufferers and consequently, offer better daily living.

Issues that need to be addressed by future research:

- Routine use of quality of life and global functioning questionnaires for diagnosis and treatment of sleep disorders.
- Additional epidemiological studies including risk factors.
- Consensus on questionnaires used in epidemiological studies.

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